UN environment programme

BASEL / ROTTERDAM / STOCKHOLM CONVENTIONS

BUSINESS CASE FOR THE DEVELOPMENT OF HAZARDOUS WASTE MANAGEMENT INFRASTRUCTURE

In Bangladesh

IMO INTERNATIONAL MARITIME ORGANIZATION

SENSREC | SAFE AND ENVIRONMENTALLY SOUND RECYLING OF SHIPS

Published in 2017 by
SENSREC Programme Coordination Unit
International Maritime Organization
4 Albert Embankment
London SE1 7SR
United Kingdom

Photo credits. Front cover © IMO. Other photos © IMO.

Please cite this document as: Business case for the development of hazardous waste management infrastructure. Sofies SA. Secretariat of the Basel, Rotterdam and Stockholm Conventions, UNEP. IMO-SENSREC, 2017.

The SENSREC Programme is a joint collaboration between IMO and the Government of Norway aimed at improving standards of ship breaking and recycling around the world. The project encourages the use of safe and environmentally sound recycling of ships, including improving downstream waste management and standards of operational safety and health for the workforce employed by the ship recycling and related industries. It also encourages the adoption of technologies and innovative solutions that can improve the standards and efficiency of ship recycling.
SENSREC.imo.org

Executing Agency:
IMO - the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.
www.imo.org

Funding Agency:
The Norwegian Agency for Development Cooperation
https://www.norad.no/en/

Norad

Secretariat of the Basel, Rotterdam and Stockholm Conventions
United Nations Environment Programme
International Environment House
1219 Châtelaine (Geneva)
Switzerland

Safe and Environmentally Sound
Ship Recycling in Bangladesh
Work Package 2: Planning the management
of hazardous materials

Business case for the development of hazardous waste management infrastructure

February 2017

Table of Contents

1. Introduction

The Safe and Environmentally Sound Ship Recycling (SENSREC) project is designed to enhance the development of safe and environmentally sound ship recycling in Chittagong, Bangladesh, with the aim of improving the standards and therefore the sustainability of the industry. Work package 2 addresses the development of downstream hazardous waste management capacity in the Chittagong region.

The Hazardous Waste Assessment reports – developed during the previous project tasks (August 2016) – provided an estimate of the volume, sources and **types of hazardous wastes** that will need to be treated and disposed of. The aim of the current report is thus to present the **business case for the setting up of the hazardous waste management infrastructure**, also known as a Common Hazardous Waste Treatment, Storage and Disposal Facility (TSDF), and identify potential partners, donors and financing models for implementation.

Sustainable hazardous waste management includes **not only ensuring sound environmental and social practices, but also sound economics and financials**. To facilitate this, the right **enabling conditions are crucial**. Once this enabling environment is in place, the waste sector can attract **various forms of investment** – from local, regional as well as international companies, funding agencies and governments.

2. Approach

A step-by-step approach is adopted to:

1. Outline of the **business case drivers** for a sustainable hazardous waste management facility;

2. Identify **key parameters** for establishing and operating a TSDF including capital expenditure (capex) and operating expenditure (opex), financing models, revenue models and ownership and governance structures;

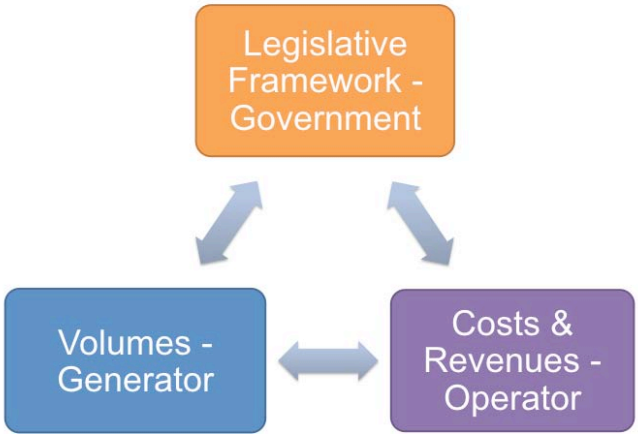
3. Examine **case studies** from India and other developing countries to provide examples and comparisons of different models, cost and revenue structures and sources of hazardous wastes, as well as a broader enabling framework supporting the business case;

4. Present a **business case** for Bangladesh and identify key gaps in the enabling framework, if any; and,

5. Identification of **donors and recommendations** for implementation.

3. Business Case Drivers

The business case for a hazardous waste facility is interlinked to three main elements – a strong legislative and compliance framework, sufficient volumes of hazardous wastes and cost recovery opportunities for the operator. Therefore, to ensure the TSDF is viable, a strong collaborative working relationship between the government, hazardous waste generators and hazardous waste facility operator is essential.



Influence of the legislative framework/ government:
A strong legislative framework for the proper disposal of hazardous waste with clearly allocated responsibilities and penalties for non-compliance is an essential condition that creates the demand for the environmentally sound disposal of hazardous waste, and the bedrock for a business case. The legislative framework may influence at several levels, both in terms of volumes of hazardous wastes requiring disposal and the requisite costs. It provides the basis for the categorization of hazardous waste as well as its treatment and disposal routes, penalties for non-compliance, and the inventory, compilation and update of national hazardous waste related data. Legislation and governmental decision-making also impact the costs and operational aspects of a TSDF by specifying minimum standards and technical requirements (e.g. permitting, licensing and monitoring requirements, environmental impact assessment (EIA) requirements, etc.). It also has the power to support the establishment and operation of a TSDF through siting and land acquisition, low cost land/lease models for the land, grants, loans and other subsidies to cover any viability gap.

Influence of waste volumes/ generators:
A TSDF normally needs sufficient waste volumes to be viable through economies of scale. The volume and type of hazardous waste generated is inherently linked to the costs and revenues of an operator as different types of wastes need different treatment and disposal operations (e.g. direct landfilling has very different costs in comparison to incineration). As larger volumes of hazardous waste are generated and disposed of improperly, there is greater pressure on the government for stringent legislation.

Influence of cost and revenues/operator:
The costs and revenue structure employed by an operator influences the willingness of generators to comply. If costs are too high, there will be greater tendency to avoid TSDF disposal, with lower volumes reaching the TSDF. An operator may also request the government to grant special terms and concessions, including lobbying, to secure monopoly catchment areas (i.e. areas where only one waste management facility is in operation, thus ensuring sufficient volumes of waste).

4. Key Parameters

This chapter presents the **main cost overheads and revenue sources for setting up and operating a TSDF**, as well as **ownership and financial models**.

4.1 Summary overview

The costs of a TSDF are dependent on several factors, but are **largely influenced by design criteria and specifications such as size, proposed infrastructures within and to support the TSDF** including the essential and non-negotiable elements, as well as optional or "good-to-have" elements. Costs are divided into two categories, namely capital expenditure and operating expenditure.

- **Capital expenditure**: Investment in plant and machinery that is depreciated over time.
- **Operating expenditure**: Operation and maintenance costs involved in daily activities.

In addition to the above, an important aspect for TSDFs is to sufficiently provision for any liabilities from environmental accidents as well as the safe management of the landfill post capping[1], over typically a 30-year period. This is especially important in the case of bankruptcy of the TSDF operator.

Cost recovery is an important aspect for financial sustainability of the TSDF. Most commonly, TSDFs rely on cost recovery under the polluter-pays principle. This may be supplemented by government funds raised through specific taxes. Revenue streams include user fees or tipping/gate fees, membership fees, compulsory fees on generators backed by legislation, as well as other supplementary sources of revenue for services such as transportation, chemical analysis, etc.

International experience shows that most recent TSDFs, especially in South Asia, are based on Public-Private Partnership (PPP) models, typically with an initial corpus of financing through a combination of loans, grants and equity to launch the operation, with revenues through user fees. Government support can include concessional land lease terms, capital grants, low cost loans, etc. Other funding sources can be multilateral financial organizations such as the World Bank and Asian Development Bank, among others. Subsidized technical assistance is also given by various donor agencies.

4.2 Cost overheads

Pre-operative investments: These include expenses associated with pre-feasibility studies, technical reports, environmental impact assessments, fulfilling permitting procedures, etc. These are expenses necessary to start TSDF operations, and typically also include stakeholder consultation, information dissemination, education and communication activities, geo-technical assessments and laboratory analyses for siting suitability, as well as permitting/licensing costs.

[1] Capping involves placing a cover over contaminated material such as landfill waste or contaminated soil.

Land: Siting hazardous waste facilities is always controversial. Planning for hazardous waste infrastructure must account for the geography of hazardous waste generation and the cost of transportation from generators to treatment and disposal facilities. The cost of land for a project can vary depending on whether it provided on lease or is purchased by the operator.

Administrative Buildings: For administrative offices, analytical laboratories, worker welfare, etc., as well as secured storage and handling areas for any temporary storage and pre-treatment/stabilization prior to landfilling or incineration.

Site development: Costs associated with construction including digging, landfill liner and leachate systems installation, etc. based on technical design specifications, national regulations and international best practices, as well as site-specific geological features.

Incinerator costs**:** Costs of installation of an incinerator, including furnace and pollution mitigation equipment such as flue gas cleaning stacks, measurement and monitoring systems. The cost of the incinerator depends on the type and capacity of the installation.

Plant and machinery: Costs of purchasing various plant and machinery for moving, handling and transporting hazardous wastes such as cranes, a weigh bridge, dumpers, trucks, etc.

Analytical laboratory: Costs of laboratory testing, sampling and analysis equipment, machines and instruments.

Other infrastructure: Includes costs for internal roads, a waste water and leachate treatment plant, wheel wash, green belt development, administrative support e.g. computers, software, etc.

Manpower costs: For management, administration, technical, security and ground staff for the operation of the TSDF.

Maintenance costs: The costs for maintenance of plant and equipment, including repairs, replacements, upgrades, etc. Maintenance is the biggest operating cost (generally 22 per cent of all operating costs[2]).

Fuel and utilities costs: Costs for fuel, including fossil fuels, alternative fuels (e.g. agro waste) and electricity to operate plant and machinery, the incinerator, etc. Water for process use and gardening.

Compliance and monitoring costs: Includes costs for statutory compliance with licensing and permitting requirements, monitoring costs of environmental parameters, external environmental audits, financial audits, etc.

Financing costs: Debt service or interest costs towards loans, bonds, etc., and other funding availed.

Closure costs: Capping costs, post-capping ongoing monthly monitoring and management costs, decommissioning of buildings and equipment, as well as provisions for worker pensions, retirement benefits, etc.

[2] Sofies SA.

Liability: Funding for environmental remediation in case of any adverse incidents of pollutants being released, and consequential remediation costs and compensation as well as provisioning for sufficient funds for safe management post closure. This is typically through insurance and money set-aside in escrow accounts.

Ongoing community engagement: Corporate social responsibility (CSR) programmes, community support and local area development costs to bolster the social license to operate.

4.3 Revenue sources

Disposal/ tipping fee: The generator pays user charges, sometimes also called disposal or tipping fees, based on the waste type to be disposed of.

1. Direct disposal into landfill: the least cost option, where the operator can directly dispose of the hazardous waste into specially engineered landfill cells without any pre-treatment required.
2. Treatment/stabilization of wastes and then disposal into landfill: this is calculated often as the cost of direct landfilling plus the cost of materials, handling and a bulking factor.
3. Direct incineration/pre-treatment and incineration: this is normally the most expensive disposal option, with charges varying depending on the result of chemical analyses.

Membership fee: A TSDF often requires generators to be members of the common facility, and to pay a membership fee to access it. The rate of such fees can be either a flat rate, or differentiated based, for example, on capital expenditure, turnover, hazardous waste volume, etc. Such fees may be paid monthly or annually as minimum monthly service commitment charges, and adjusted against user charges or tipping fees. Fee clauses may include the forfeiture of such fees if the generator does not utilize the facility.

Hazardous waste transport charges: An operator may offer transport services to its users at an additional cost, charged on the basis of a minimum fee, weight and distance from the TSDF.

Analytical services: TSDFs necessarily have on-site analytical laboratories with sophisticated equipment for waste testing. Some TSDFs offer laboratory analytical services as a separate service, to both users/members of the TSDF as well as other organizations.

4.4 Ownership models and financing mechanisms

Public ownership: State-owned facilities for hazardous waste management that are built, owned and operated by the government.

Private ownership: Fully financed by private sector funds, potentially with limited government incentives such as subsidies.

Public-Private Partnership (PPP): PPP is a specific form of project finance where a public service is funded and operated through a partnership of government and the private sector, typically structured under a long term concession arrangement, channeled to a Special Purpose Vehicle (SPV)[3] formed for the same. In return, the company undertaking the project (project company) receives a pre-determined revenue stream over the life of the concession from which private sector investors extract returns. In the PPP model the investment is shared between the government and a private operator. A project under PPP may include all stages of the project's lifecycle, starting from conceptualization, design, construction of infrastructure where necessary, up to delivery of services and maintenance. In such projects, the private sector is the active party that undertakes the activities, depending on the model, starting from the stage of conception and up to the stage of operation and maintenance.

Typically, the management is outsourced to a private operator who is given a concession by the government. Two common models under PPP include:

1. *Build-Operate-Transfer (BOT):* Here the private sector manages the infrastructure on a build-operate-transfer basis. The private sector manages the infrastructure until a specified time, after which the government is responsible for its management.
2. *Build-Own-Operate-Transfer (BOOT):* This is an extended version of the BOT model. Under this model the ownership and management belongs to the private sector until a specified time. After expiry of the term, ownership and management is transferred to the government.

Typical stakeholders in a PPP transaction

- ***Sponsors***: The equity investor(s) and owner(s) of the project company – it can be a single party, or more frequently, a consortium of sponsors. In PPP projects, the government/procurer may also retain an ownership stake in the project and therefore also be a sponsor. The terms and conditions of the sponsors' ownership of the project company will be covered under a shareholders' agreement and will codify matters relating to the control, corporate governance, funding, ownership, share transfer and termination of the Special Purpose Vehicle (SPV).
- ***Procurer***: the procurer will be the municipality, council or department of state responsible for tendering the project to the private sector, running the tender competition, evaluating the proposals and selecting the preferred sponsor consortium to implement the project.
- ***Government***: The government may contractually provide a number of undertakings to the project company, sponsors, or lenders which may include credit support in respect of the procurer's payment obligations (real or contingent) under a concession agreement.
- ***Lenders***: May be one or more commercial banks and/or multilateral agencies and/or export credit agencies and/or bond holders.

[3] A legal entity created solely to serve a particular function, such as the facilitation of a financial arrangement or creation of a financial instrument.

Types of Financial Participation by National / State Government

1. *Technical Assistance Financing*: Government finances pre-feasibility and feasibility studies for projects.
2. *Viability Gap Financing*: Viability Gap Financing (VGF) is meant for projects where financial viability is not ensured but their economic and social viability is high. VGF could be in the form of capital grants or annuity payments, or both.
3. *Equity*: The government, through a state-owned entity, finances the project through a partial equity stake.

Loans and grants from Bilateral & Multilateral Agencies: These are financing options available in various modalities such as loans, grants, technical assistance and also private sector lending, provided by agencies such as the World Bank, Asian Development Bank, other development banks such as KfW Development Bank (from Germany), JICA (from Japan), etc., specifically for infrastructure projects in developing countries.

Equity, Bonds & Debentures: Operators can use one or more forms of financing from the market through equity (shares), bonds and debentures, each offering different risk and return profiles.

Loans from financial institutions and banks: Commercial loans raised by operators to be paid back with interest. Most financial institutions have financing criteria including pre-requisites that must be respected.

Development cooperation support: Developed countries have various programs and funds to support environmental improvements and sustainable development. Notable among those that have supported TSDFs in the region are GIZ (from Germany) and JICA (from Japan).

Clearly identifiable demand for project services: Contractual mitigation of revenue risk: e.g. through legal obligations, etc.

Financial due-diligence including scenario analysis of project cash flows, identification of risks and their impact on the project, risk mitigation measures, etc.

Access to finance for example, government assurance and participation of government in a project through equity, grants, loans. High leverage and long tenure financing is required to achieve attractive economics.

5. Case Studies - India

Legal, institutional and financial mechanisms

The Government of India promulgated the Hazardous Waste (Management & Handling) Rules [HW (M&H)] in 1989 through the Ministry of Environment and Forests (MOEF) under the aegis of Environment (Protection) Act [E(P) Act], 1986. Under the HW (M&H) Rules, hazardous wastes are divided into 18 categories. The

role and responsibilities of the waste generator, state/central pollution control boards and state government is clearly defined. In order to encourage the effective implementation of these rules, the MOEF has further brought out the Guidelines for HW (M & H) Rules in 1991 providing the technical details of the principles of HWM covered under the HW (M&H) Rules. The HW Rules were last amended in 2015.

The first TSDF in India became operational in 2002. Since then, 38 TSDFs have been set up or are under construction. Ballpark estimates suggest that an integrated hazardous waste TSDF with secured landfill and incineration capacity, and associated costs related to analytical laboratories, building, storage facilities, plant and equipment requires a capital investment of approximately US$ 13 million (in 2016), not including the cost of land.

For this report, 4 TSDF's from India are described as case studies:

1. Taloja (Near Mumbai)
2. Alang
3. Haldia (West Bengal)
4. Dabbasapete (Bangalore)

5.1 Taloja (near Mumbai)

Location

The Taloja TSDF is located in an industrial area north of Mumbai. The TSDF is on 40 hectares (approximately 100 acres) of land. The project was commissioned in 2001, and operational since 2002. The landfill is expected to operate for 20 years, with an additional 30 years of post-closure monitoring and management. The land is owned by a government entity, Maharashtra Industrial Development Corporation (MIDC), and leased at very nominal terms of Rs.1 per square meter to the TSDF operator.

Capacity and Infrastructure

The TSDF is designed with a landfill capacity of 120,000 MT/year, or a lifetime capacity of 2'400'000 MT, and 2 incinerators, each with a capacity of 2.5 MT per hour. Including the administrative, laboratory, supervisory and operational staff, the TSDF provides approximately 300 jobs.

Access to waste

The TSDF has a captive catchment area of 3500+ industrial units, particularly highly polluting industries such as chemicals and pharmaceuticals, as well as metal manufacturing and processing industries. Hazardous waste generated from industrial activities in its catchment area is greater than the annual capacity of the TSDF. In addition, the TSDF is also used to dispose of confiscated goods from the port and airport (e.g. illicit drugs).

The Hazardous Waste Rules notified by the MOEF, which are given further support by a Supreme Court Order, require compulsory membership of TSDF for all hazardous waste generating industries, thereby establishing a near monopoly in the region, with a captive client base.

Financing

The operator model is DBOOT (Design, Build, Own, Operate and Transfer). It is operated by a private entity, Mumbai Waste Management Ltd., a part of the Ramky Group that also manages several other TSDFs in India. Initial project costs in 2001 were projected as INR 42.30 crores (approximately USD 9 million at 2001 exchange rates). Of this, under various support schemes to develop hazardous waste management infrastructure, a subsidy of INR 12 crores (approximately USD 2.5 million at 2001 exchange rates) was provided by the government. 5% of the tipping fee is deposited in a separate ESCROW account towards post closure maintenance costs.

Tipping Fees & Membership Cost

The TSDF charges a one-time membership fee based on a tiered system linked to the type of industry and its size – measured by establishment cost. In addition, all members have to pay an annual membership fee, also called "Minimum Monthly Commitment Charges". Industries located in the industrial areas promoted by MIDC (the landowner) are given a discount, as seen in the table below[4]:

Industry Category	Red		Orange	
Establishment Cost	MIDC (INR)	NON-MIDC (INR)	MIDC (INR)	NON-MIDC (INR)
Less than USD 90k	20,000	30,000	10,000	15,000
USD 90 k – 150 k	35,000	50,000	20,000	25,000
USD 150 k - 735 k	75,000	1,00,000	40,000	50,000
USD 735 k – 1.5 m	1,00,000	1,50,000	50,000	75,000
USD 1.5 m – 7.35 m	1,50,000	2,25,000	75,000	1,10,000
USD 7.35 m – 15 m	2,00,000	3,00,000	1,00,000	1,50,000
USD 15 m – 30 m	3,00,000	4,50,000	1,50,000	2,25,000
> USD 30 m	5,00,000	7,50,000	2,50,000	3,75,000

Table 1: Membership rates in INR for Mumbai Waste Management Limited TSDF near Mumbai, India. MIDC = Maharashtra Industrial Development Corporation that is a government entity developing industrial parks, and also the landowner of the TSDF. Red and Orange are the industry classifications, as decided by the pollution regulatory authority. Currency exchange rate: INR – USD (01.2017): 1 INR = 0.015 USD

The tipping fees, contingent on disposal pathway, excluding Taxes, Transportation & Tolls, as of January 2017, are as follows:

Disposal Pathway	Disposal Rate Per Ton (INR)	Disposal Rate Per Ton (USD)
Direct Land-filling	INR 1890	USD 28
Landfill After Treatment – Calculated as per the following formula: (Cost of Direct Landfill (1+Bulking Factor) + Cost of Additives+ Fuel+157.00 per MT)	Minimum INR 3500	USD 51
Incineration – rate depends on case to case basis; contingent on fingerprinting analysis report	INR 26500	USD 390

Table 2: Tipping/ Gate fees for Mumbai Waste Management Limited TSDF (as of January 2017). Currency exchange rate: INR – USD (01.017): 1 INR = 0.015 USD

[4] Rates are from January 2017 as provided on the website: http://www.mumbaiwastemanagement.com/faq.htm. Conversion from INR to USD is approximate, based on prevailing exchange rates in January 2017.

5.2 Alang

Location

The TSDF, started in 1999 in Alang, is developed largely for the disposal of hazardous wastes from the ship breaking yards. Most of the industries in and around the area are related to ship breaking, and mostly located within 10 kms of the TSDF. As the TSDF is owned by the Gujarat Maritime Board (GMB) that also leases the yards, the TSDF operator needs explicit permission to accept waste from other industries.

Capacity and Infrastructure

The TSDF has developed a high level of technical expertise, having been trained on several critical subjects such as asbestos management and permitting from European (French Navy) experts, and therefore has a high level of disposal standards and procedures.

Operator Model

The GMB is the owner of the land as well as the facility, having made the capex investment. While GMB retains ownership of the assets and plant, it contracts the day-to-day management and operation of the TSDF to a private sector operator that is operating the site since 2005.

Access to waste

The TSDF's main source of waste is from ship breaking industries in Alang that are within its captive catchment area. The waste handled by the TSDF in the recent years is shown in the table below:

Year	Landfilled (MT)	Incinerated (MT)	Bilge water (MT)	Total per year (MT)	Total ships beached at Alang
2013 -2014	5'238	359	1'864	7'506	298
2014 - 2015	4'612	545	2'122	7'280	275

Table 3: Amount of hazardous waste disposed of in the Alang TSDF

Tipping Fees & Membership Cost

The TSDF charges a small, refundable one-time membership, and nominal annual membership fees from the ship breaking facilities. The most recent tipping fees charged by the TSDF (latest update on 1st April 2016) are given in the table below.

Disposal Pathway	Disposal Rate Per Ton (INR)	Disposal Rate Per Ton (USD)
Landfill	INR 371	USD 6
Incineration	INR 10388	USD 156
Bilge water	INR 1145	USD 17

Table 4: Tipping fees/ Gate fees for GEPIL TSDF in Alang (as of January 2017). Currency exchange rate: INR – USD (01.2017): 1 INR = 0.015 USD

5.3 Haldia (West Bengal)

Location

Developed in two phases at Mouza Purba Srikrishnapur in West Bengal. Of the total estimated land requirement of 200 acres, the first phase of 70.46 acres was acquired for phase 1.

Capacity and Infrastructure

The total amount of hazardous wastes to be landfilled at the site is 120,000 tonnes per annum. In addition, 60,000 tonnes per annum of hazardous wastes can be stabilized and treated and 20,000 tonnes per annum of hazardous wastes can be incinerated. The design life of the TSDF is 25-30 years, with a post-completion monitoring period of 25 years.

Access to waste

The West Bengal Pollution Control Board constituted a technical committee comprising representatives of various industry associations, engineering institutions, the Environment Department, Government. of West Bengal, etc., to review the membership fee and the cost for the treatment and disposal of the hazardous wastes at the TSDF, Haldia. Inclusion of different industry associations in the committee facilitates the process of joining of the individual units, especially small and medium sized business enterprises (SMEs) as members of the TSDF.

As per information from 2009, at least 300 industrial units were members of the TSDF, with pressure from the State Pollution Control Board on other industrial hazardous waste generators to join the same.

The fee table in 2006 for hazardous waste disposal in Haldia TSDF was as follows:

Type of Treatment	Cost INR (in 2009)	Cost INR (equivalent in 01.2017)	Cost USD (in 01.2017)
Landfilling (per MT)	INR 990	INR 1855	USD 27
Stabilization (per MT)	INR 1597	INR 2990	USD 44
Incineration (per MT)	INR 18,500	INR 34650	USD 508
Transport (per km)	INR 4	INR 7.5	USD 0.11

Table 5: Proposed tipping fees of Haldia TSDF. Currency exchange rate: INR – USD (01.2017): 1 INR = 0.015 USD

Financing

The sources of finance for the TSDF included a combination of equity, grants and term loans from financial institutions. The share of equity of the total project was 37%, as compared to loans that provided 43% of the capital for the project, and government grants that provided the remaining 20%. The equity in the project came from the private operator (Ramky Enviro Engineers Ltd.), from deposits (potentially by members/industrial associations), as well as a small share from the state-owned Haldia Development Authority.

	INR Crores (in 2003)	INR Crores (in 01.2017)	USD (in 01.2017)	Share
Promoters equity	**20.0**	**49.7**	**7.45 million**	**37%**
Ramky (private)	*10.0*	*24.8*	*3.72 million*	*19%*
Haldia Development Authority (Public)	*0.32*	*0.8*	*120 million*	*1%*
Others	*0.32*	*0.8*	*120 million*	*1%*
Deposits	*9.36*	*23.2*	*3.48 million*	*17%*
Grants	**11**	**27.3**	**4.10 million**	**20%**
MoEF (Central Government)	*2*	*5.0*	*0.74 million*	*4%*
State Government	*2*	*5.0*	*0.74 million*	*4%*
Haldia Development Authority (Public)	*7*	*17.3*	*2.6 million*	*13%*
Term Loans	**23**	**57.1**	**8.57 million**	**43%**
Grand Total	**54**	**134.1**	**20.11 million**	**100%**

Table 6: Financing sources for Haldia TSDF ; The numbers are rounded and therefore may not total to 100% for share of financing.
Inflation factor: 148.34% from 2003 to 2016; Source: calculatorstack.com
Currency exchange rate: INR – USD (01.2017): 1 INR = 0.015 USD

The TSDF has been developed under the Public Private Partnership (PPP) model. It is a joint venture project of Haldia Development Authority (HDA) and M/s Ramky Enviro Engineers Limited. In April 2003, the Haldia Development Authority (HDA) and M/s Ramky Enviro Engineers Limited formed a joined venture company under the name M/s West Bengal Waste Management Limited (WBWML) that will Build-Own-Operate-Transfer the TSDF.

5.4 Dabbasapete (near Bangalore)

Location

About 93.18 acres of land was notified by the Karnataka Industrial Areas Development Board (KIADB) for the TSDF in Dabbasapete. Several government departments and agencies contributed towards the acquisition of the land – these were the Department of Ecology, Environment and Forests (DFEE), Karnataka State Pollution Control Board (KSPCB) and the Department of Industries and Commerce, each of which have an interest in ensuring the sound disposal of hazardous wastes. The land for the facility was given by DFEE to the private operator on a nominal lease for a period of 51 years. The ownership of the land remains with the government, under KIADB.

Capacity and Infrastructure

Each cell is designed for 40’000 tons / year. Ten cells are planned in the landfill that has a design life of 20 years, with a post closure monitoring period for an additional 30 years.

Financing

Over the 51-years lifetime of the site, the total project cost is INR 54 Crores (approximately USD 8 million as at January 2017 exchange rates). This project was technically assisted by GTZ (The German Agency for Technical Co-operation in

India, now renamed as GIZ), through its project HAWA[5]. The project began in 2001 with the partner agency – Karnataka State Pollution Control Board (KSPCB). A payback period of 8 years for the private investment made in the project was estimated. The largest share of capital costs was for site development (78%), with building (12%) and plant & machinery (10%).

Operator Model

The operator model chosen for TSDF Dabbasapete was DBOOT (Design, Build, Own, Operate and Transfer). In the initial years, the facility was monitored and managed by a Contracting Authority (CA) which was the Karnataka Industrial Areas Development Board (KIADB) and later a Special Purpose Vehicle (SPV) will take over. The SPV will have members of industrial associations and government representatives. The TSDF was scheduled to be constructed in 1 year and in operation for 20 years, with a post closure monitoring period of 30 years after the last closed landfill cell.

6. Business case in Bangladesh

In this section, we bring together the information from three components of the project: the baseline report, the hazardous waste inventory and the technical design specification, to formulate a business case for the development of hazardous waste management infrastructure in Bangladesh.

6.1 Bangladesh

Design parameters: As provided in the design document drafted as part of the project, an integrated facility with secure landfill, an incinerator, effluent treatment plant, an analytical facility, green belt, etc. designed for 10 years of operation, is proposed on a 20 acre site. The design and costing document[6] proposes:

Source	Disposal pathway	Average annual generation (MT)	Cumulative 10-year generation @ 4% growth (MT)
Shipbreaking	Incineration	5,900	71,000
	Landfill	8,900	107,000
	TOTAL	**14,800**	**178,000**

	Disposal pathway	Average annual generation (MT)	Cumulative 10-year generation @ 6% growth (MT)
Industrial	Incineration	14,000	184,500
	Landfill	400	5,300
	TOTAL	**14,400**	**189,800**

Source	Disposal pathway	Average annual generation (MT)	Total (MT)
Shipbreaking + Industrial	Incineration	19,900	255,500

[5] http://www.hawa-project.org/about.htm

[6] Design options for the environmentally sound management of hazardous waste in Chittagong, Bangladesh.

Shipbreaking + Industrial	Landfill	9300	112,300

Legislative Framework

Hazardous waste is defined under the Bangladesh Environment Conservation Act 1997. In addition, new hazardous waste-specific legislation is being considered, and a draft is in circulation. The Government is also keen to promote sustainable development, and one of its strategies is to promote the 3R concept of reduce, reuse and recycle. Under the strategies to promote 3R[7], it has been suggested that setting-up of TSDFs should be considered within industrial estates/EPZs. It also proposes that the Government consider providing financial support for establishing such treatment facilities, taking into consideration their distance from generators and availability of wastes, including ensuring viability through sufficient catchment areas, in order to encourage private sector investment.

For private sector investment, Bangladesh has been developing investor-friendly policies, and encourages foreign and domestic investment. A limited scan of the legislative framework did not suggest any barriers to involvement and/or ownership of international companies in the development and operation of a TSDF.

The PPP policy is currently administered under the Prime Minister's Office (PMO), indicating a high level of support for its effective implementation. The PPP policy and strategy was published in August 2010. Under this the Public Private Partnership Authority was established as a separate autonomous office to support sector line ministries to facilitate PPP projects. The Government has also allocated a significant amount of money in the national budget to take PPPs forward. Under the PPP policy, **environmental, industrial and solid waste management projects** have been identified as a priority sector. A new PPP law has since been passed in August 2015, and guidelines for procurement of PPP projects published in 2016[8].

With a view to making private participation attractive, the Government may retain a provision for financial participation in PPP projects. The following are the three kinds of participation:

Technical Assistance Fund: This fund is dedicated to finance pre-feasibility studies for prospective projects, preparation of request for quotation (RFQ) and request for proposal (RFP) documents for the projects and preparation of concession contracts for projects.

Viability Gap Funding: In case of infrastructure projects it is often the case that projects are not viable financially although they may have great impacts on the economic and social aspects of the people of the country. By participating in financing with the private sector, the government may encourage private participation. VGF may be of many forms. It could be capital grants or annuity payments.

[7] www.uncrd.or.jp/content/documents/RT2_01_Bangladesh.pdf
[8] www.pppo.gov.bd/events2015_enactment-of-the-bangladesh-public-private-partnership-ppp-act-2015.php

Infrastructure Financing: The Government has an arrangement for financing infrastructure projects through a specialized financial institution. The Bangladesh Infrastructure Finance Fund Limited (BIFFL) and the Infrastructure Development Company Limited (IDCOL) are two entities through which to finance PPP projects. The Industrial Promotion and Development Company of Bangladesh Limited could also be a potential source of financing. In addition, the Bangaldesh Government also provides various incentives and subsidies such as tax-holidays for socially/ environmentally relevant infrastructure projects.

The nature of the project may involve more than one central ministry as well as other local and regional government agencies, especially for identification and allocation of the land. These could include the Planning Commission, Ministry of Environment, Ministry of Industries, Ministry of Commerce and Ministry of Finance at the national level, the Pollution Control Board, the Chittagong Municipality, Port Authority and other agencies such as Bangladesh Economic Zones Authority (BEZA) which is responsible for the Mirershorai Economic Zone near Chittagong. In addition, the Bangladesh Shipbreakers Association (BSBA) and other industry associations may also be involved, potentially also as a partner/investor.

Financial framework

In 2009, the Bangladesh Bank[9] launched a green refinancing line with an initial focus on solar energy, biogas, and **waste treatment projects**; its scope has continuously been expanded and now covers 47 items, with 2 billion Taka (US$25 million) available for commercial banks to disburse loans to key green sectors. Loans are provided at 5% with interest chargeable to bank customers capped at 9%. The refinancing window provides concessional credit but uses commercial banks as a gatekeeper in the allocation of capital. The default risk remains with the banking sector.

Environmental risk rating: Banks are asked to report on environmental due diligence carried out in relation to loan applications from environmentally sensitive areas, including ship breaking.

Green finance reporting: Banks report on their exposure to ‘direct green finance’ that includes financing for key green technologies including renewable energy and biogas, water supply, wastewater treatment, solid and hazardous waste disposal, etc.

Green refinancing offtake: The green refinancing scheme is a 2 billion Taka (US$25 million) revolving loan fund[10]. Overall 1,053.5 million Taka (US$13 million) has been disbursed from this fund during FY10-FY14. The main uses were for biogas, solar assembly plant and energy efficient brick kilns. There is potential to tap into the financing window to partially finance a TSDF as the loan is still not fully disbursed.

Investment Promotion and Financing Facility (IPFF): As per information from the IPFF, projects will be supported on market terms and will require at least a 30% equity from the private infrastructure promoter. Out of the balance 70%, PFIs and/or other institutions will finance at least 20% and the rest may be financed by IPFF. The

[9] https://www.bb.org.bd/

[10] http://unepinquiry.org/wp-content/uploads/2015/04/Designing_a_Sustainable_Financial_System_in_Bangladesh_Summary_Briefing.pdf

maximum repayment period for investment loans will be 20 years from the first disbursement of an investment loan. Infrastructure projects from the following sectors or sub sectors may be implemented as private infrastructure projects: environmental, industrial and solid waste management projects.

Stable tax regime: A host country's tax laws can have a direct impact on the profitability of a public private partnership project and so need to be considered by the potential service provider/investor and the host government to ensure that the project is viable.

Risks

Risk	Impact	Mitigation strategy
Competition for disposal in TSDF (both illegally, and other methods e.g. cement kiln co-processing)	High	Strong legislation and enforcement prohibiting illegal disposal of hazardous wastes; High penalties
Low volume of hazardous waste (low demand leading to cost/ revenue mismatch)	High	Diversified sources of hazardous wastes; Compliance driven demand through enforcement of strict waste disposal rules
Low user willingness to pay (limited fees leading to cost/revenue mismatch)	Medium	Proportionate charges that are reasonable and comparable to that of other TSDFs so that waste generators have lower incentive to be non-compliant
Siting and location viability	Low	The detailed technical feasibility report developed at the pre-feasibility stage should cover the technical, environmental and social risks and mitigation methods
Cost overruns	Medium	Can impact overall profitability/ viability of the project therefore tight controls on project management are necessary
Construction risk – delays and their impact on costs for investors	Medium	Can impact overall profitability/ viability of the project therefore tight controls on project management are necessary
Completion delays and failure of completion of ancillary infrastructure e.g. access roads	High	Investors have less control over such supportive infrastructure, therefore regular communication and interaction with linked/ related parties is essential
Operating risk – lower than expected performance	Medium	Management of the TSDF by experienced operators
Currency risk of forex denominated loans can result in unexpected fluctuations in debt servicing and project economics	Low	Currency risk can be hedged, and/ or avoided by taking local currency loans

Limited interest of private sector participation	High	Greater government support and commitment, both financially and through policy and legislative frameworks

6.2 Scenario Analysis

A simplified business model calculator was developed based on the anticipated volume of hazardous waste from the assessment, with capital costs coming from the design document and operational costs estimated based on interviews with TSDF operators in India.

The baseline year is taken as 2016, in line with the hazardous waste assessment. Based on the design document, the landfill capacity is considered as 11,230 MT/year, while incinerator capacity is considered as 25,550 MT/year.

Estimated capital costs: The capital expenditure estimated in the design document is a total of USD 12 million, with USD 6 million in stage 1 and USD 6 million for expansion in stage 2.

Estimated operational costs: The costing of operational costs is based on the per tonne cost of landfill and incinerator operation costs in India. Approximate costs were gathered during interviews with TSDF operators, and while the exact waste characterization often decides the final disposal rate, the rates used are an average. The operational cost/tonne assumed for the business case model is given in the table below. This cost/tonne includes the main cost overheads identified in section 4.2 above. The simplified costing model enables a quick estimation of scenarios based only on generic estimates and is not a substitute for a fully fledged business plan that looks at detailed cash-flow and revenue projections once a project has been identified as a potential business case worth investigating. The current cost estimates provide a conservative ballpark figure of the potential operational costs based on the proposed technical design. It is inflation linked, and increasing in line with an inflation rate of 7% across the entire time period.

Inflation and foreign exchange rates: The simplified business model assumes a constant inflation rate of 7% per annum and an exchange rate of 1 USD = 80 BDT.

The key variables that are tested for sensitivity as they can have the most impact on the financial viability of the project, are as follows:

Demand: While the hazardous waste assessment provides an estimate of the expected generation, it is likely that waste generators are reluctant to pay TSDF tipping fees, and therefore not all waste generated will be diverted to the TSDF. The scenarios considered for the demand variable are:

1. High demand: 100% diversion to the TSDF right from the start.
2. Moderate demand: 50% diversion to the TSDF to start with, going up to 80% with improved compliance over 10 years.
3. Low demand: Starting with 20% diversion, and going up to 50% of estimated waste generated diverted to the landfill in 10 years.

Financing Cost: The financing cost is dependent on three variables:

Interest rate/ cost of capital: The interest rate for loans taken for the capital expenditure upfront. As it is a simplified model, the interest rate is calculated on the entire capex amount required from the start, only split between stage 1 and stage 2 for Bangladesh. However, in reality the loan is likely disbursed in installments based on project requirements, based on which interest costs are calculated. The current estimate however gives a conservative ballpark figure to assess the inherent viability of the project. The interest rate is also often variable, however in the simplified model we use a fixed interest rate across the entire loan period. The three scenarios of interest rates considered are:

1. Low interest rate: Considered at 5% per annum interest rate. Soft loans from development banks and multilateral agencies are often at 5% or below.
2. Moderate interest rate: Considered at 9% per annum interest rate, this is typically the interest rate available for high value infrastructure projects, that is just in line with or slightly above inflation.
3. High interest rate: Considered at 12% per annum interest rate, this is the minimum cost of capital from the banking sector, with typical commercial rates even higher, depending on the credit risk evaluation of the project and borrower profile(s).

Repayment period: The repayment period is an important metric as it provides the time spread over which the loan, including both principal and interest, must be repaid back. Ideally, the repayment period should be distributed over the entire life of the TSDF, until it reaches capacity. A longer debt repayment period is preferable as it allows the operator to have higher debt service coverage, especially in the initial years when revenues may be lower than later in time. Often, infrastructure projects funded by multilateral banks also provide a repayment holiday for the first few years, with debt servicing starting only later. In our simplified model however, we assume that the debt servicing is equally divided into installments over the repayment period. The scenarios of the repayment period are considered:

1. Long repayment period: This is considered as 15 years from project start.
2. Moderate repayment period: This is considered as 12 years from project start.
3. Short repayment period: This is considered as 10 years from project start.

Debt-equity ratio: The ratio of debt and equity is contingent on many factors, including government participation, lending rules of the donors/ financiers and the risk appetite of private investor. The three scenarios of debt-equity ratio considered in the analysis are as follows:

1. Low debt: With a ratio of 40% debt and 60% equity.
2. Moderate debt: With a ratio of 60% debt and 40% equity.
3. High debt: With a ratio of 80% debt and 20% equity.

Tipping fees: This is the main source of revenue for the TSDF, apart from smaller revenue streams for fingerprinting analysis and membership charges, etc. 8 cases of tipping fees are modeled. The tipping fees are inflation-linked, so increase in line with inflation. The 8 cases are as follows:

1. The design document: The design document developed as part of the project suggested tipping fees, which is considered as the base case.
2. Base-case+25%: This is based on the base case in the design document with the tipping fees higher by 25%.
3. Base-case -25%: This is based on the base case in the design document with the tipping fees lower by 25%.

4. Cost+20%: The cost plus scenario is based on the estimated operational costs for landfill and incineration, with the fees set at 20% above the operational cost to provide a margin for the operator.
5. Cost+25%: The cost plus scenario is based on the estimated operational costs for landfill and incineration, with the fees set at 25% above the operational cost to provide a margin for the operator.
6. Cost+30%: The cost plus scenario is based on the estimated operational costs for landfill and incineration, with the fees set at 30% above the operational cost to provide a margin for the operator.
7. GEPIL: This is the current rate charged by GEPIL, the operator of the TSDF in Alang, India.
8. MWML: This is the current rate charged by the TSDF operator in Mumbai.

Debt-Service-Coverage Ratio (DSCR): The DSCR is an indicator used in project financing to check cash flow against current debt obligations that lenders routinely use to assess a project's viability before making a loan. A DSCR of 0.95 means that there is only enough net operating income to cover 95% of annual debt payments. A DSCR greater than 1 means the entity has sufficient income to pay its current debt obligations, while a DSCR less than 1 means it does not. Typically, a DSCR of 2.0 or above is generally preferred and acceptable to lending institutions, but in some cases, financial institutions may consider a DSCR above 1.5.

IRR: Internal rate of return: This is a measure used to assess the viability of an investment. Typically, the IRR should be higher than the cost of capital and the minimum required rate of return. The higher the IRR on a project and the greater the amount by which it exceeds the cost of capital, the higher the net cash flows to the investor. In other words, the Internal Rate of Return is the interest rate that makes the Net Present Value zero. Typically, investors look for a minimum IRR of 10%, with more common rates around 20%.

Scenarios

The scenarios analyze various permutations and combinations of the above variables. This resulted in 648 scenarios to compare on their DSCR and IRR performance. In Figure 1 below, all 648 scenarios are plotted with their DSCR on the X-axis and the IRR on the Y-axis. The one dimension highlighted in the figure is the demand dimension – with the colours representing the three levels of demand – namely blue being high demand, orange being moderate demand and grey representing low demand scenarios.

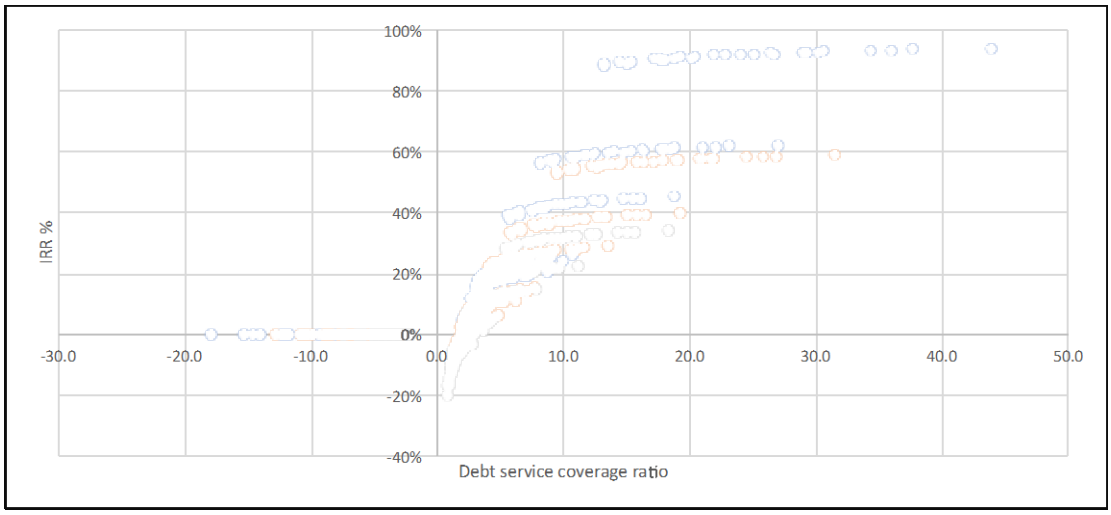


Figure 1: Scenarios assessed over 648 combinations of 5 variables (Demand, Interest rate, Repayment period, Debt ratio and Tipping fee)

The scenario analysis shows that tipping fees and demand are the key drivers, with both interlinked variables. The higher the tipping fees, the better the financial ratios, however, higher fees would result in lower diversion to the TSDF as waste generators try to avoid the high disposal costs. However, on the other hand, very low tipping fees make the project unviable on a stand-alone commercial basis, and would need substantial grant funding or other subvention tools to bridge the viability gap.

Filtering out outliers and negative values where DSCR and or IRR are negative, we get a smaller sub-set of scenarios that are within a reasonable range with DSCR between 1.5 – 15 and IRR between 10% – 30%. Figure 2 below shows the more likely scenarios within this range.

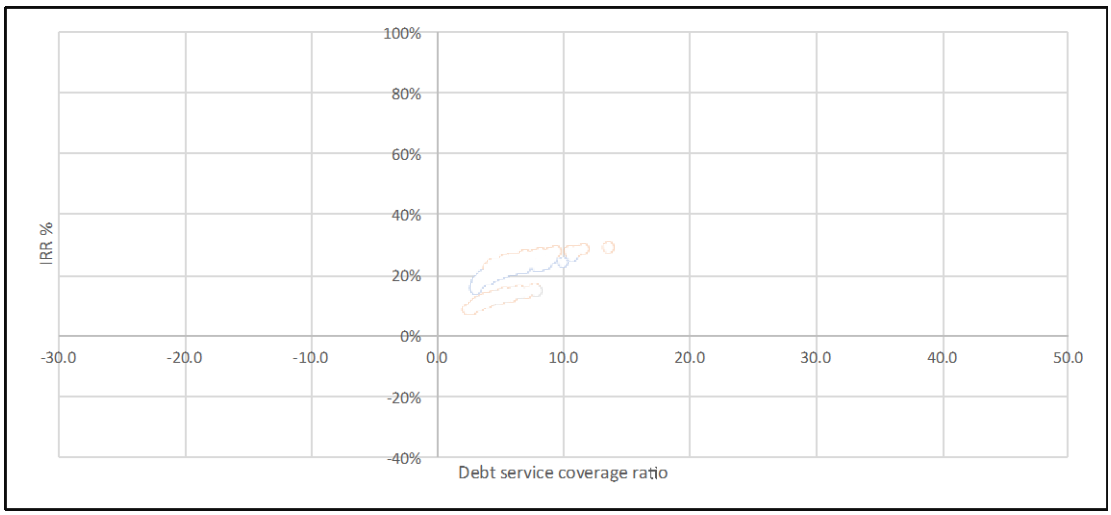


Figure 2: Realistic scenarios, filtering out outliers and negative values for DSCR and IRR

It is interesting to see from the scenarios in the figure above that even with a lower demand than expected (grey dots), starting only with 20% of the estimated volume and going only up to 50% in 10 years, the business case is still viable by adapting other variables such as lower interest rates, a longer repayment period and lower debt levels and moderate tipping fees.

The scenario analysis shows that the GEPIL rates, which are the lowest tipping fees, are not commercially viable, unless other mechanisms and tools are used for subvention and financing of the viability gap. The specific mention of this case is relevant particularly for the shipbreakers, as their comparative costs against ship breakers in Alang will put them at a comparative disadvantage.

Capacity Utilization

A crucial aspect of the commercial viability is the capacity utilization of the TSDF. The current model has been based on the values from the design document, including the capacity of landfill and the estimated lifetime of TSDF. Given that the commercial viability is very sensitive to demand, the sizing of the facility needs to be appropriate so that it can meet the demand without incurring the unnecessary costs of an idle facility. **The modeling estimates show that there is scope for increasing the lifetime of the facility, or reducing its size and investment cost.** In all estimated scenarios, the landfill capacity is not utilized to its full potential. The incineration capacity is also not utilized to an optimum level, even in the best-case scenario of 100% diversion of all estimated waste right from the start.

7. Donors & Funding Sources

This section lists potential donors and types of funding streams available for various costs. The terminology of funding type/funding modality and funding objectives are explained below.

ODA: Official Development Assistance: Foreign aid provided by OECD countries to developing countries. These are typically commitments that are made bilaterally between governments of OECD and developing countries, based on countries and themes identified by donor countries as priorities.

Soft loan: Also called concessional financing, these are typically loans to developing countries at zero or below-market rates of interest made by multilateral agencies such as the Asian Development Bank, World Bank and government agencies. Such loans with no interest or below-market rates of interest, are typically made to developing countries that would be unable to borrow at the market rate. In addition to lower interest rates, often these loans also come with lenient terms, such as extended grace periods in which only interest or service charges are due, there are interest holidays or longer amortization schedules (in some cases up to 50 years) compared with conventional bank loans.

Technical assistance: Finances the cost of consultancy and technical and commercial assessment by experts that can be before or as part of project implementation. This is one of the most common financing modalities by multi-lateral agencies and donors.

TA loan: Technical Assistance (TA) loans finance the preparation of design for an ensuing investment project to be financed under a public private partnership (PPP) scheme that has been already sanctioned for implementation.

Grant: Grants are a made to a project that meets specific donor objectives and where the financing does not need to be repaid to the donor. It normally is only a part of the financing requirements, with other financing needs met through other modalities.

Private sector loan: These are typically made to large financial institutions for making credit available further to private enterprises at concessional market rates.

Donor	Funding type	Funding objective	Example
GIZ	Technical assistance	Technical assistance to establish business plans and technology transfer to PPP operators	Bangalore TSDF, India
JICA	Technical assistance	Technical assistance/ grant	GEPIL expansion, Alang TSDF, India
USTDA	Technical assistance	Pre-feasibility study	https://www.ustda.gov/program/regions/south-and-southeast-asia
KfW	Soft loan	Construction of TSDF	Bangalore TSDF
ADB	TA loan	Preparation of comprehensive project feasibility document	Dhaka – Chittagong Expressway PPP Design
ADB	Grant	Improve project viability and realisation	Coastal Climate-Resilient Infrastructure Project
ADB	Technical Assistance	Pre-feasibility study	Strategic master plan for Chittagong Port
ADB	Private sector loan	Provide access to finance	Loan to BRAC Bank to finance socially and environmentally sustainable projects
World Bank	Investment project financing	Financing to governments for activities that create the infrastructure for sustainable development	http://www.worldbank.org/en/country/bangladesh/projects
World Bank	Development policy financing	budget support to government entities for a program of policy and institutional actions to help achieve sustainable growth	
World Bank	Trust fund grants – e.g. GEF	Grants support actions to combat major environmental	http://www.worldbank.org/en/topic/climatechange/b

		issues	rief/gef

8. Recommendations

Organization structure

The financing and operation of the TSDF can be organized in several ways, with different levels of government and private involvement.

Option 1: Government-led model: This is when the government owns wholly or the large majority of shares, and operates the TSDF as a public-sector company, that may or may not have the involvement of private sector investors.

Option 2: Operating & Management model: In this structure, the government makes the upfront capital expenditure and is the owner of the TSDF. However, it contracts out the day-to-day operation to a private sector player, which can be based on a minimum revenue guarantee, fixed fee, or revenue sharing model.

Option 3: PPP Special Purpose Vehicle (PPP SPV): The **most commonly used organizational structure** for establishing and financing hazardous waste disposal facilities, **especially in emerging economies**, is through a PPP framework, typically by setting up a Special Purpose Vehicle (SPV) for the same. The many advantages of such a structure include:

- Liabilities and obligations associated with the project are one step removed from the private sector, government and other stakeholders directly, making it less risky as an investment.
- Such a structure also makes it possible to have a high leverage, with a large debt component, thereby requiring lower equity injection at the outset, resulting in making the project investment a less risky proposition, and the potential for greater shareholder return on equity.
- Debt finance interest may be deductible from profit before tax (PBT), thereby further reducing the (post tax) weighted average cost of capital of the project. The advantages noted above will all help to lower the cost of a project and therefore are desirable from both private investor and government stakeholder perspectives.
- In addition, from the government perspective, the PPP model helps bring private participation and infuse capital and expertise into infrastructure projects that would be less likely to be realized given limited government resources, in addition to technical operational expertise.

Financing

Leveraging private capital with public finance: e.g. tapping into refinancing schemes; accessing target-driven green investment (e.g. Bangladesh Bank has a 5% target for green finance as a percentage of its total portfolio[11]).

11

Economic instruments

Reduced interest rate loans: Government, banks or multilateral financing agencies could consider providing a soft loan at a lower than market interest rate or an interest subsidy to the project. This would help increase the DSCR making the project more financially viable.

Moratorium period: Given the large capital outlay upfront and potentially slow uptake of services, it is expected that it will take a couple of years for the TSDF capacity to be fully utilized. During these initial years, it is possible to consider including in the loan terms a moratorium period before interest payments should start – **typically of 2 or 3 years** can be considered. This will also improve the IRR.

Taxation policy: Although tax incentives are controversial, and have their pros and cons, for priority essential social and environmental infrastructure, the government may consider giving the project a tax incentive, such as an initial tax holiday. The Government of Bangladesh already provides for exemption of tax from newly established industrial undertakings and newly established physical infrastructure facilities [Section – 46B, 46C][12]. There are **tax holidays for newly established physical infrastructure facilities** set up in between 30 June 2015 to 30 June 2019, that **includes waste treatment plants** in the list. The **tax exemption for 10 years** starts at 100% of income in the first year, reducing to 10% in the 10th year. Lower tax outgoings also help increase the viability of the project, and improves the IRR.

Additional tax based instruments the Government can consider to spur demand for hazardous waste disposal services is to reduce VAT and other indirect taxes. The current tax code does not specify any VAT for waste management or waste disposal services in Bangladesh, and this should be clarified.

9. Conclusion

The business case analysis showed that **the demand for hazardous waste disposal services exists, not only from ship breaking, but also from other industrial activities**.

However, to make it a **commercially viable** and bankable business, several important framework **conditions** are necessary:

- The first, and potentially most important one is to **strengthen legislative frameworks** that give regulators better tools to monitor and enforce compliance, such as reporting requirements for wastes generated and disposal pathways – which requires the corresponding field control resources, permitting and licensing requirements, etc. linked to membership of a TSDF, and a legal basis for TSDF operators to charge for tipping fees. While a strong legislative framework backed by robust institutions is a necessary condition for any investor, it is not sufficient on its own, unless backed by a strong judicial mechanism to provide a fallback for law and judicial oversight of contractual breaches and imposition of fines and penalties.

---

https://wedocs.unep.org/bitstream/handle/20.500.11822/7422/-Designing_a_Sustainable_Financial_System_in_Bangladesh_Summary_Briefing-2015Designing_a_Sustainable_Financial_System_in_Bangladesh_Summary_Briefing..pdf?sequence=3&isAllowed=y

[12] http://bdlaws.minlaw.gov.bd/sections_detail.php?id=672&sections_id=38036

- A second aspect of the commercial viability is the **capacity utilization of the TSDF**. The current model has been based on the values from the design document including the capacity of landfill and estimated lifetime of the TSDF. Given that the commercial viability is very sensitive to demand, the sizing of the facility needs to be appropriate so that it can meet the demand without incurring unnecessary costs of an idle facility.
- The third important ingredient is **the close collaboration** of a wide-range of stakeholders from government agencies, private sector, international development agencies and multilateral financial institutions, for example through the implementation of PPP, that allows a leveraging of both private and public sources of financing.

This document is submitted **together with a model** that includes all of the **calculation parameters** mentioned is this report, which can be adapted on a step-by-step approach during the next stages of the project.
